

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (Currently amended) A method for verifying whether a trace can be
2 produced by a generator, comprising:
 - 3 receiving a specification for the generator, wherein the generator is a finite
4 state machine that defines a set of inputs and outputs, and wherein the generator
5 ~~contains~~ may contain parametric inputs to model non-determinism;
 - 6 receiving the trace, wherein the trace is a sequence of assignments of non-
7 parametric inputs and outputs for the generator, and wherein the trace does not
8 contain assignments of parametric inputs;
 - 9 using the specification to build a data structure that can be used to
10 determine if a non-parametric input and output are consistent with the current
11 state of the generator; and
 - 12 verifying elements of the trace, wherein verifying a given element involves
13 using the data structure to determine if there exists any parametric input
14 assignment that causes a match between non-parametric inputs and outputs of the
15 generator with the ones specified in the given element of the trace; and
 - 16 if the specification of the generator is sequentially deterministic, and hence
17 does not depend on parametric inputs, translating the generator into a checker and
18 using that checker to verify the trace.
- 1 2. (Original) The method of claim 1,

2 wherein the generator is sequentially deterministic, which means that there
3 exists a single next state for each combination of current state, non-parametric
4 input, and output; and

5 wherein using the data structure to determine if there exists any parametric
6 input assignment involves,

7 using the data structure to perform a satisfiability test to
8 determine if there exist any parametric inputs that can match the
9 non-parametric input and output assignment of the generator with
10 the ones of the trace at a current state, and

11 computing a unique next state based on the current state,
12 the non-parametric input and the output.

1 3. (Original) The method of claim 1,

2 wherein the generator is sequentially non-deterministic, which means that
3 the next state can depend on a parametric input, and consequently there can exist
4 more than one next state for some combinations of current state, non-parametric
5 input, and output; and

6 wherein using the data structure to determine if there exists any
7 parametric input assignment involves determining a set of next states;

8 wherein determining the set of next states involves considering all possible
9 parametric inputs, all states in a current set of states, the non-parametric input and
10 the output;

11 wherein if there exists at least one state in the set of next states, the non-
12 parametric input and output are consistent with the generator.

1 4. (Original) The method of claim 3, wherein determining the set of next
2 states involves computing a forward image and constraining the parametric input
3 and output to their assignments in the trace.

1 5. (Original) The method of claim 1, wherein the trace is produced by a
2 simulation of a system under test.

1 6. (Original) The method of claim 1, wherein the data structure is in the
2 form of a binary decision diagram (BDD).

1 7. (Original) The method of claim 1, wherein if for all possible parametric
2 inputs the non-parametric input and output are not consistent with a generator
3 output, the trace is not valid.

1 8 (Canceled).

1 9. (Currently amended) A computer-readable storage medium storing
2 instructions that when executed by a computer cause the computer to perform
3 method for verifying whether a trace can be produced by a generator, comprising:
4 receiving a specification for the generator, wherein the generator is a finite
5 state machine that defines a set of inputs and outputs, and wherein the generator
6 contains may contain parametric inputs to model non-determinism;
7 receiving the trace, wherein the trace is a sequence of assignments of non-
8 parametric inputs and outputs for the generator, and wherein the trace does not
9 contain assignments of parametric inputs;
10 using the specification to build a data structure that can be used to
11 determine if a non-parametric input and output are consistent with a parametric
12 input and output for the generator; and
13 verifying elements of the trace, wherein verifying a given element involves
14 using the data structure to determine if there exists any parametric input
15 assignment that causes a match between non-parametric inputs and outputs of the
16 generator with the ones specified in the given element of the trace; and

17 if the specification of the generator is sequentially deterministic, and hence
18 does not depend on parametric inputs, translating the generator into a checker and
19 using that checker to verify the trace.

1 10. (Original) The computer-readable storage medium of claim 9,
2 wherein the generator is sequentially deterministic, which means that there
3 exists a single next state for each combination of current state, non-parametric
4 input, and output; and

5 wherein using the data structure to determine if there exists any parametric
6 input assignment involves,

7 using the data structure to perform a satisfiability test to
8 determine if there exist any parametric inputs that can match the
9 non-parametric input and output assignment of the generator with
10 the ones of the trace at a current state, and

11 computing a unique next state based on the current state,
12 the non-parametric input and the output.

1 11. (Original) The computer-readable storage medium of claim 9,
2 wherein the generator is sequentially non-deterministic, which means that
3 the next state can depend on a parametric input, and consequently there can exist
4 more than one next state for some combinations of current state, non-parametric
5 input, and output; and

6 wherein using the data structure to determine if there exists any
7 parametric input assignment involves determining a set of next states of a
8 generator;

9 wherein determining the set of next states involves considering all possible
10 parametric inputs, all states in a current set of states, the non-parametric input and
11 the output;

12 wherein if there exists at least one state in the set of next states, the non-
13 parametric input and output are consistent with the generator.

1 12. (Original) The computer-readable storage medium of claim 11,
2 wherein determining the set of next states involves computing a forward image
3 and constraining the parametric input and output to their assignments in the trace.

1 13. (Original) The computer-readable storage medium of claim 9, wherein
2 the trace is produced by a simulation of a system under test.

1 14. (Original) The computer-readable storage medium of claim 9, wherein
2 the data structure is in the form of a binary decision diagram (BDD).

1 15. (Original) The computer-readable storage medium of claim 9, wherein
2 if for all possible parametric inputs the non-parametric input and output are not
3 consistent with a generator output, the trace is not valid.

1 16 (Canceled).

1 17. (Currently amended) An apparatus that verifies whether a trace can be
2 produced by a generator, comprising:

3 a receiving mechanism configured to receive a specification for the
4 generator, wherein the generator is a finite state machine that defines a set of
5 inputs and outputs, and wherein the generator contains-may contain parametric
6 inputs to model non-determinism;

7 wherein the receiving mechanism is additionally configured to receive the
8 trace, wherein the trace is a sequence of assignments of non-parametric inputs and

9 outputs for the generator, and wherein the trace does not contain assignments of
10 parametric inputs;
11 a data structure building mechanism configured to use the specification to
12 build a data structure that can be used to determine if a non-parametric input and
13 output are consistent with a parametric input and output for the generator; and
14 a verification mechanism configured to verify elements of the trace,
15 wherein verifying a given element involves using the data structure to determine if
16 there exists any parametric input assignment that causes a match between non-
17 parametric inputs and outputs of the generator with the ones specified in the given
18 element of the trace; and
19 a translation mechanism configured to translate the generator into a
20 checker and use that checker to verify the trace if the specification of the generator
21 is sequentially deterministic, and hence does not depend on parametric inputs.

1 18. (Original) The apparatus of claim 17,
2 wherein the generator is sequentially deterministic, which means that there
3 exists a single next state for each combination of current state, non-parametric
4 input, and output; and
5 wherein while using the data structure to determine if there exists any
6 parametric input assignment, the verification mechanism is configured to,
7 use the data structure to perform a satisfiability test to
8 determine if there exist any parametric inputs that can match the
9 non-parametric input and output assignment of the generator with
10 the ones of the trace at a current state, and to
11 compute a unique next state based on the current state, the
12 non-parametric input and the output.

1 19. (Original) The apparatus of claim 17,

2 wherein the generator is sequentially non-deterministic, which means that
3 the next state can depend on a parametric input, and consequently there can exist
4 more than one next state for some combinations of current state, non-parametric
5 input, and output; and

6 wherein while using the data structure to determine if there exists any
7 parametric input assignment, the verification mechanism is configured to
8 determine a set of next states of a generator;

9 wherein determining the set of next states involves considering all possible
10 parametric inputs, all states in a current set of states, the non-parametric input and
11 the output;

12 wherein if there exists at least one state in the set of next states, the non-
13 parametric input and output are consistent with the generator.

1 20. (Original) The apparatus of claim 19, wherein while determining the
2 set of next states the verification mechanism is configured to compute a forward
3 image and constraining the parametric input and output to their assignments in the
4 trace.

1 21. (Original) The apparatus of claim 17, wherein the trace is produced by
2 a simulation of a system under test.

1 22. (Original) The apparatus of claim 17, wherein the data structure is in
2 the form of a binary decision diagram (BDD).

1 23. (Original) The apparatus of claim 17, wherein if for all possible
2 parametric inputs the non-parametric input and output are not consistent with a
3 generator output, the trace is not valid.

1 24 (Canceled).

1 25. (Currently amended) A means for verifying whether a trace can be
2 produced by a generator, comprising:

3 a receiving means for receiving a specification for the generator, wherein
4 the generator is a finite state machine that defines a set of inputs and outputs, and
5 wherein the generator contains ~~may contain~~ parametric inputs to model non-
6 determinism;

7 wherein the receiving means is additionally configured to receive the trace,
8 wherein the trace is a sequence of assignments of non-parametric inputs and
9 outputs for the generator, and wherein the trace does not contain assignments of
10 parametric inputs;

11 a data structure building means configured to use the specification to build
12 a data structure that can be used to determine if a non-parametric input and output
13 are consistent with a parametric input and output for the generator; and

14 a verification means configured to verify elements of the trace, wherein
15 verifying a given element involves using the data structure to determine if there
16 exists any parametric input assignment that causes a match between non-
17 parametric inputs and outputs of the generator with the ones specified in the given
18 element of the trace; and

19 a translation means configured to translate the generator into a checker and
20 use that checker to verify the trace if the specification of the generator is
21 sequentially deterministic, and hence does not depend on parametric inputs.